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# मानक

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IS 8534-1 (2005): Mine tub couplings and drawbars, Part 1: General requirements [MED 8: Mining Techniques and Equipment]



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“Knowledge is such a treasure which cannot be stolen”



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भारतीय मानक  
खान टब युग्मन और कर्षण शलाकाएँ

भाग 1 सामान्य अपेक्षाएँ  
( दूसरा पुनरीक्षण )

*Indian Standard*  
**MINE TUB COUPLINGS AND DRAWBARS**  
**PART 1 GENERAL REQUIREMENTS**  
( *Second Revision* )

ICS 73.100.10

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard (Part 1) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Mining Techniques and Equipment Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1977 and revised in 1994. This revision has been undertaken to incorporate changes based on the experience gained in the implementation of the Indian Standard.

The changes incorporated in this revision mainly refer to material and heat treatment involved in the manufacture of mine tub couplings.

This standard covers the general requirements for the various types of tub couplings and drawbars used to connect the mine tubs to form a train of tubs.

This standard is one of a series of Indian Standards on mine tub couplings and drawbars. Other parts in this series are:

- (Part 2) : 1994 C-link and D-shackle type couplings (*first revision*)
- (Part 3) : 1994 R-shackle and link type couplings (*first revision*)
- (Part 4) : 1994 F-shackle and link type (*first revision*)
- (Part 5) : 2005 Drawbars (*second revision*)
- (Part 6) : 1994 Hook and D-shackle type

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# Indian Standard

## MINE TUB COUPLINGS AND DRAWBARS

### PART 1 GENERAL REQUIREMENTS

#### (Second Revision)

#### 1 SCOPE

This standard (Part 1) covers the general requirements for various types of couplings and drawbars used for connecting mine tubs in a set of tubs and having a maximum safe working load of 50 kN.

#### 2 REFERENCES

The following standards contain provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All the standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard indicated below:

IS No.	Title
2102 (Part 1) : 1993	General tolerances: Part 1 Tolerances for linear and angular dimensions without individual tolerance indicators ( <i>third revision</i> )
4432 : 1988	Case hardening steels ( <i>first revision</i> )
5517 : 1993	Steels for hardening and tempering — Specification ( <i>second revision</i> )
5616 : 1982	Short link chain for lifting purposes general conditions of acceptance ( <i>first revision</i> )

#### 3 TERMINOLOGY

For the purpose of this standard, the definitions given in 3.1 to 3.3 shall apply.

**3.1 Safe Working Load** — The load used for the computation of stresses in the design of a coupling and drawbar and is the maximum permissible drawbar pull from the haulage.

**3.2 Proof Load** — The test load to which the coupling or any components of the coupling or drawbar is subjected to in the finished condition.

**3.3 Factor of Safety** — It is the ratio of ultimate tensile strength to the safe working load.

#### 4 MATERIAL

##### 4.1 Couplings

**4.1.1** The material used for the manufacture of couplings except 'C' type coupling shall be one of the following:

- a) Steel designation 20C15 conforming to IS 5517,
- b) Steel designation 20Ni2Cr2Mo2 conforming to IS 4432, and
- c) Any other steel not inferior to those specified above with respect to properties required for duty conditions.

**4.1.2** Material used for 'C' type coupling shall be steel of designation 20Ni2Cr2Mo2 conforming to IS 4432.

##### 4.2 Drawbars

The material used for the manufacture of drawbars shall be one of the following:

- a) Steel designation 20C15 conforming to IS 5517,
- b) Steel designation 20Ni2Cr2Mo2 conforming to IS 4432, and
- c) Any other steel not inferior to those specified above with respect to properties required for duty conditions.

**4.3** The material of the weld shall, as far as possible have the same properties as the constituent part.

**4.4** All components shall be forged from material as agreed to between the manufacturer and the user. Only tried and centrifuged material shall be used in the manufacture of the mine tub couplings and drawbars.

#### 5 GENERAL REQUIREMENTS

**5.1** Each component of coupling and drawbars shall have static factor of safety of not less than seven.

**5.2** Forged components shall avoid sudden changes of section, thickness and/or shape.

**5.3** Forging shall be such that the fibre structure of the material is not transverse to the line of pull in couplings and drawbars.

5.4 Every component of coupling and drawbar shall show good workmanship and finish and shall be free from defect, such as blow holes, cracks, slag inclusions, etc, and shall conform to the tolerances in accordance with IS 2102 (Part 1).

5.5 All holes shall be drilled or bored in axial alignment at one setting.

5.6 The design and application of couplings and drawbars shall ensure straight pull through the axis.

5.7 The arrangement of the coupling and drawbar shall be flexible to provide easy movement of tubs on curves. They shall be able to be securely attached to prevent accidental disconnection.

5.8 The arrangement of coupling and drawbar shall be such that there is no fouling when tubs are buffed together and there is no locking of tubs on curves.

5.9 In determining the maximum number of tubs to be attached together by a particular type of coupling and drawbar arrangement to form a set of tubs on a given installation, due considerations shall be given to the following:

- Gradient of the track,
- Curvature of the track,
- Speed,
- Dynamic loading,
- Shock loading, and
- Frictional resistance of the track.

5.10 Wherever necessary, electrical arc welding shall be done. Slag shall be carefully removed after each run of welding. The links shall be butt welded and shall be smooth as required in IS 5616.

## 6 HEAT TREATMENT

6.1 Each finished couplings/drawbars with its end fittings after all forging and welding operations are over, shall be normalized at the following temperatures:

<i>Designation of Steel</i>	<i>Normalizing Temperature °C</i>
20C15	860 - 910
20Ni2Cr2Mo2	860 - 890 <sup>1)</sup>

6.2 The couplings and drawbars with its end fittings after all forging and welding operations shall be 'hardened and tempered' or 'normalized' or 'normalized and tempered' at suitable temperatures according to the steel used in the manufacture of drawbars. The guideline given in Table 1 may be followed.

6.3 Details of the heat treatment given to couplings and drawbar components shall be endorsed on certificate of test (see Annex A).

## 7 HARDNESS

Hardness of each component of couplings and drawbar shall be as given below depending on the material used for manufacture of the components:

<i>Steel Designation</i>	<i>Hardness HB</i>
20C15	200 to 230
20Ni2Cr2Mo2	250 to 280
Other steels	220 to 270

## 8 TESTS

### 8.1 Tests for Chemical Compositions

One percent of couplings/drawbars from each production batch shall be tested for chemical composition. The couplings/drawbars shall conform to the composition specified in relevant standard.

### 8.2 Tests for Microstructure

One percent of couplings/drawbars from each production batch shall be tested for microstructure. The couplings/drawbars shall conform to the microstructure relevant to the material used in the manufacture of the components.

**Table 1 Guideline for Heat Treatment**  
(Clause 6.2)

Sl No.	Designation of Steel	Normalizing Temperature °C	Hardening Temperature °C	Tempering Temperature °C	Quenching Agent
i)	20C15	860-900	860-900	550-660	Water or oil
ii)	20Ni2Cr2Mo2	*	820-850	*	Water

\* Suitable temperature may be adopted so as to attain the optimum properties.

<sup>1)</sup> May be altered to attain the optimum properties.

### 8.3 Tests for Hardness

Ten percent of the couplings/drawbars from each production batch shall be tested for hardness. The couplings/drawbars shall conform to the hardness specified in 7.

### 8.4 Destructive Test

One coupling/drawbar from each production batch of 200 or as agreed to between the purchaser and the supplier shall be subjected to destructive test. The coupling/drawbar shall not show any sign of failure or deformation at any load less than seven times the rated safe working load.

### 8.5 Proof Load Test

One coupling/drawbar from each production batch of 10, shall be subjected to a proof load of not less than three times the safe working load which it shall withstand without showing any permanent set. After removal of the proof load and determination of the permanent set (if any), each coupling shall be tested for cracks, etc, by magnetic particle test. In case of failure of the coupling/drawbar in proof load test another coupling/drawbar from the lot shall be tested and in case of failure in the subsequent test, each coupling from the lot shall be tested.

## 9 CERTIFICATE OF TEST AND EXAMINATION

The supplier shall provide certificates of test and examination in the form shown in Annex A with every consignment of coupling/drawbars. The certificate of test shall also indicate the particular of heat treatment, hardness of different components and the results of the tests carried out in accordance with 8.1 to 8.5.

## 10 MARKING

Each coupling and drawbar shall permanently and legibly be marked on a non-vital component with the following information:

- a) Manufacturer's identification mark;
- b) Safe working load, in kN;
- c) Type of heat treatment given; and
- d) Identification mark bearing with manufacturer's certificate of test and examination (*see* Annex A).

10.1 The stamps used for marking shall be of 5 mm size. Care shall be taken that the indentation is neither too sharp nor excessive in depth.

### 10.2 BIS Certification Marking

The mine tub couplings and drawbars may also be marked with the Standard Mark.

10.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 11 PARTICULARS TO BE SUPPLIED AT THE TIME OF ENQUIRY OR ORDER

The following particulars shall be supplied at the time of enquiry or order:

- a) Type of the coupling/drawbar;
- b) Specification of material and method of manufacture;
- c) Heat treatment desired; and
- d) Further tests or chemical analysis, if required.



ANNEX A

[Clauses 6.3, 9 and 10(d)]

PROFORMA FOR THE CERTIFICATE OF TESTAND EXAMINATION OF CLIP

A) Particulars of destructive tests and proof load tests:

Identification Mark	Description	Quantity Tested	Load Applied During Destructive Tests kN	Proof Load Applied kN	Safe Working Load kN

- B) Particulars of heat treatment and hardness  
of different components of couplings/drawbars

.....  
.....
- C) Particulars of chemical tests on different  
components of couplings/drawbars

.....  
.....
- D) Particulars of microstructure tests on  
different components of couplings/drawbars

.....  
.....

We hereby certify that the couplings/drawbars described above comply in all respect with IS 8534 (Part 1).

Signature .....

Date .....

## ANNEX B

(Foreword)

## COMMITTEE COMPOSITION

Mining Techniques and Equipment Sectional Committee, ME 08

<i>Organization</i>	<i>Representative(s)</i>
Directorate General of Mines Safety, Dhanbad	SHRI Y. K. SHARMA ( <i>Chairman</i> ) SHRI ANUP VISWAS ( <i>Alternate</i> )
Bharat Coking Coal Ltd, Dhanbad	SHRI RAMJI SAHAY
Bharat Earth Movers Ltd, Bangalore	SHRI V. PALANISWAMY SHRI T. R. LOGANATHAN ( <i>Alternate</i> )
Central Coalfields Ltd, Ranchi	CHIEF GENERAL MANAGER (OPERATIONS) CHIEF GENERAL MANAGER (EQUIPMENTS) ( <i>Alternate</i> )
Central Mine Planning & Design Institute Ltd, Ranchi	SHRI S. K. CHATTERJI SHRI KISHORE KUMAR ( <i>Alternate</i> )
Central Mining Research Institute, Dhanbad	SHRI V. N. PATHAK
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Gujarat Mineral Development Corporation, Ahmedabad	SHRI S. N. MATHUR
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National Aluminium Co Ltd, New Delhi	SHRI R. C. PATI SHRI C. M. D. MURTY ( <i>Alternate</i> )
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North Eastern Coalfields, Guwahati	SHRI ARVIND KUMAR SHRI S. A. H. ABIDI ( <i>Alternate</i> )
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*Member Secretary*SHRI P. VENKATESWARA RAO  
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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

**Headquarters:**

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones: 2323 0131, 2323 3375, 2323 9402

**website : [www.bis.org.in](http://www.bis.org.in)**

### Regional Offices:

## Telephones

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

$$\begin{cases} 2323 & 7617 \\ 2323 & 3841 \end{cases}$$

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi  
KOLKATA 700054

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